HILL PRAIRIES OF ILLINOIS

BY

ROBERT AUGUST EVERS

B.S., Kansas State College of Agriculture and Applied Science, 1933
M.S., University of Illinois, 1941

AN ABSTRACT OF A THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN BOTANY
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R. A. Evers.

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HILL PRAIRIES OF ILLINOIS

The grassland on the upper slopes of the bluffs on the east side of the larger streams in Illinois attracts the attention of the more observing travelers. These grasslands are hill prairies.

Hill prairie is here defined as a prairie or grassland on a pronounced slope. Prairie is here used as a vegetational term, rather than as a locational or topographic term for an expansive flat.

Hill prairies in Illinois occur on the more exposed upper slopes of the bluffs on the east side of the larger stream valleys. Their presence is not restricted to any one section of the state, as they can be found from northern to southern Illinois.

Of the many hill prairies that occur in Illinois, sixty, with a combined area of almost 200 acres, were visited. The total acreage of hill prairie in Illinois is very conservatively estimated at 600.

Topography exerts the strongest control, or place influence, that determines the occurrence of hill prairie on the upper slopes of the bluffs. The southwest-facing position of the slope, which exposes the site to the hot two-o'clock summer sun and to the prevailing southwest summer winds, provides extremely xeric conditions under which prairie thrives. Rapid to excessive drainage due to slope, and permeable loess substratum, are reinforcing conditions. The altitude of the bluff and the width of the adjacent bottomlands also contribute to dryness of the upper bluff slopes.

The vegetation is the bunch-grass type, with *Andropogon scoparius* the usual dominant species. *Bouteloua curtipendula* is usually present, in a few places dominant. *Sorghastrum nutans* and a few other bunch-grasses occur frequently and may be locally dominant. *Poa pratensis,* not native in hill prairies, is established in some of them.

For detailed studies of vegetation, plots were staked in undisturbed and in pastured variants of the same prairie slope. Data were obtained for plot sizes ranging from 1/256 milacre to 9 milacres. The total area staked in each prairie was 75 milacres. On one milacre of each variant all plant individuals were mapped and counted. Species lists were compiled for plots of the several sizes.

In the undisturbed prairie there were 1833 plants per milacre; 1300 of these were *A. scoparius.* In the pastured prairie there were 1341 plants per milacre; 848 of these were *A. scoparius.* For the milacre of undisturbed prairie, 5018.37 sq. in. were covered by foliage, or 80% of the plot. In the pastured prairie, 3262.04 sq. in. were covered, or 52% of the plot.

The ground space occupied by plants in the unpastured prairie was 1884 sq. in., 1781 sq. in. occupied by *A. scoparius.* In the pastured prairie, the ground space was found to be 1404 sq. in., that of *A. scoparius* 1107 sq. in.

In the undisturbed prairie, at ground surface, 69.97% of the milacre was bare loess; 77.62% in the pastured prairie. In the unpastured prairie, 20% of the ground was not covered by foliage; 48% in the pastured prairie.

The available space per plant in the undisturbed milacre was found to be 3.42 sq. in. per plant; in the pastured prairie it was 4.68 sq. in. per plant.

For study of frequence of occurrence in plots within hill prairie, a well-graduated distribution of frequence percentages is obtained with quadrat sizes 1/16 to 1/4 milacre in undisturbed prairie; 1/4 milacre in pastured prairie.

From species-area curves, the smallest representative area was determined for the undisturbed prairie as 0.76 milacres, and for the pastured, 1.26 milacres. The minimum area was found to be 3.80 milacres and 6.30 milacres for unpastured and pastured types; the fair-sized stand 38.0 and 63.0 milacres for unpastured and pastured respectively.

The flora of thirty-six hill prairies was used as a basis for presence studies. The "constants" (species in 29 or more of the 36 locations) of this type of prairie in Illinois are *Andropogon scoparius, Erigeron strigosus, Bouteloua curtipendula, Petalostemum purpureum, Euphorbia corollata, Penstemon pallidus, Andropogon gerardi, Verbena stricta,* and *Kuhnia eupatorioides.* Twenty-five species were found on 18 or more of the 36 prairies used in the study of presence. Only one, *Melilotus alba,* is of foreign origin. Species most characteristic of the hill prairie type (i.e., of greatly lower presence in other prairie types) are *Bouteloua curtipendula, Psoralea tenuiflora, Petalostemum candidum, Linum sulcatum,* and *Lithospermum incisum.*

Prairie possibly existed on these bluffs from pre-Wisconsin time to the present. This vegetation will presumably continue in these sites until a change in climate occurs to provide more mesic conditions, or until advanced erosion of the bluffs forms a continuously gentle slope, or until high cliffs are greatly reduced.

The known flora of Illinois hill prairie is 391 species, distributed in 212 genera and 74 families. The largest family is *Compositae* with 26 genera and 71 species. *Aster* is the largest genus, with 12 species. Thirty species are of foreign origin.

Although most hill-prairie plants are probably of southeastern origin, nine species are distinctly western or southwestern, and four are from the Ozark plateau. Of these 13 species, *Rudbeckia missouriensis, Mentzelia oligosperma,* and *Asclepias stenophylla* are in Illinois seemingly restricted to hill prairie and, with *Galium virgatum,* to adjacent rock ledges.

Some prairie slopes are grazed or burned, yet the prairie persists. As these steep slopes were never plowed, they represent one of the least disturbed types of prairie in Illinois.

VITA

Robert August Evers was born in Quincy, Illinois, on January 17, 1912. He received his elementary and high school education in the public schools of Quincy, graduating from the Senior High School in 1929. Thereupon, he entered Iowa Wesleyan College for his freshman year, after which he transferred to Kansas State College of Agriculture and Applied Science. He received the degree of Bachelor of Science in general science in June, 1933. He taught biology and general science at Quincy over a number of years. During four summers, 1938 to 1941, he pursued graduate study at the University of Illinois and received the M. S. degree. In October, 1946, he became Assistant Botanist in the Illinois State Natural History Survey, and also continued his graduate studies at the University of Illinois. He is a member of the Botanical Society of America, the American Society of Plant Taxonomists, the Illinois Academy of Science, and of the honorary societies of Sigma Xi, Phi Delta Kappa, Phi Kappa Phi, and Phi Sigma. He is author of "A scientific experiment to increase the bluebird population," "The trees of Adams County, Illinois," "*Setaria faberii* in Illinois," "*Andropogon elliottii* in Illinois," "Notes on the Illinois flora," "Four plants new to the Illinois flora," "A new lepidodendron from Illinois," and co-author with C. C. Hoff of "Siloam Springs State Park."